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Incentives for energy-efficient behavior at the workplace: a natural field experiment on eco-driving in a company fleet

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Abstract

Reducing greenhouse gas emissions is a highly prevalent goal of public policy in many countries around the world. Convincing people to drive more fuel-efficient ("eco-driving") can contribute substantially to this goal. However, there is a lack of scientific studies on the effects of individual monetary and non-monetary incentives for eco-driving, especially in organizational settings and with regards to demonstrating causality, e.g., by using controlled experiments. We address this gap with a six months long controlled natural field experiment and introduce a monetary and a non-monetary reward for eco-driving to drivers of light commercial vehicles in different branches of a logistics company. Our results show an average reduction of fuel consumption of 5% due to a tangible non-monetary reward and suggest only a small reduction of the average fuel consumption in the equivalent monetary reward treatment. Building on the extant research on psychological determinants of transport behavior and economic incentives, we give possible explanations for the observed behavior and the potential superiority of non-monetary rewards over pure money. Policy implications for private and public actors are discussed.

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Keywords: Eco-driving; fuel efficiency; fuel consumption; monetary incentives; non-monetary incentives; driver monitoring.

1. Introduction

The road transport sector plays an important role in world energy use and emissions of greenhouse gases [1], with up to 30% to 40% of road sector CO2 emissions coming from road freight transport [2]. In addition, the share of road freight transport is predicted to increase even further in the future [3] [4]. It is undisputed that decisions on the operational level, i.e., on the driving style have a large influence on the fuel consumption [3] [4], with fuel-efficient driving or "eco-driving" reducing the fuel consumption between 5% to as much as 62 % [6] [7] [8]. Despite this large potential, there are several gaps in the

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current state of research on energy-efficient behavior and eco-driving that can hinder an effective policy formulation to influence driving behavior and, thus, increase fuel efficiency in the road freight sector.

First, even though research on pro-environmental behavior in organizational settings should have a high priority because of the large impact of organizational actions on the environment [9], we observe a lack of studies on energy-efficient behavior in the workplace. While research has identified a number of energy-saving interventions to be effective at changing behavior in the residential sector [10], only few studies focus on changing energy consumption behavior in an organizational context [11] [12] [13]. Second, much of the evidence on interventions to increase pro-environmental behavior in general and eco-driving in particular is based on aggregate statistics, narrative type case studies, or very small sample sizes [14] [15]. Thus, there is a need for a systematic and statistically reliable evaluation of interventions to change driving behavior, using, e.g., controlled experiments to clearly demonstrate causality, especially in the transport sector [16]. Finally, to our knowledge there is no scientifically sound evaluation of the effects of monetary and non-monetary rewards for eco-driving.

We address this gap by conducting a natural field experiment on the effects of monetary and non-monetary incentives for eco-driving, one of the very few studies within transport research employing a natural field experiment to demonstrate causality [16]. Specifically, we introduce a monetary and a non-monetary reward for eco-driving to drivers of light commercial vehicles in different branches of a German logistics company and test their efficacy over a period of six months. To our knowledge, this is the first study that analyzes empirically the isolated effects of incentives for eco-driving on fuel consumption in a real-world setting.

2. Incentives for eco-driving

2.1. Eco-driving

The main characteristics of a fuel-efficient and, thus, economically and ecologically beneficial driving style, often called “eco-driving” [7], can be summarized as follows [5] [17] [18]: (1) Accelerating moderately and changing gear optimally (shifts up between 2000 and 2500 revolutions per minute), (2) keeping a safe distance from other vehicles and anticipating traffic flow and signals to avoid unnecessarily sharp breaking and acceleration, (3) driving at appropriate speeds (adhering to speed limits) and maintaining an even driving pace (using cruise control where appropriate), and (4) avoiding excessive idling. For the field experiment, this qualitative view had to be transferred into a measurable definition. We approximate the degree of eco-driving as achieving an average fuel consumption below an individual reference value (in liters per 100 kilometers). This reference value was calculated in a way that balances between different drivers’ situations, e.g., different levels of eco-driving in the past (see chapter 3).

Previous studies found that eco-driving can reduce the fuel consumption of passenger vehicles and light commercial vehicles between 5% to 62% [6] [7] [8] [19]. While the exact saving potential depends on the specific circumstances, e.g., car type, route, and benchmark, a majority of the studies estimates the saving potential between of 5 to 25%.

2.2. Determinants of driving behavior

According to Gardner (2009) [20] the Theory of Planned Behavior is the most widely applied model of cognitive determinants of car use. It assumes that „behaviour is most closely determined by an intention to act, which summarises motivation.“ [20]

However, research in behavioral economics also found that intention is not necessarily a good predictor of future behavior because individuals cannot predict their behavior in a context that is very

different to the state in which their intentions are elicited [16] [21]. Gardner (2009) [20] also confirms the finding that motivational models neglect the „repetitive nature of travel mode decisions“ which may become habituated and automated [22].

Assuming that driving behavior of professional drivers is mostly habitual due to its repetitive nature, interventions for eco-driving in a company fleet should be designed such that they take into account the limited predecisional information search and the lack of deliberation during habitual decision-making. The key to changing the driving behavior may be to find interventions that interrupt or disturb the habitual car use [23] [24], e.g., by making the automatic execution of the habit impossible or unattractive and by facilitating a deliberate choice of driving behavior in some way [25]. The experimental studies of [26] and [27] showed that an economic incentive (in their cases a free one-month bus pass or travel card) can be an appropriate measure to disrupt driving habits. Thus, economic incentives may be sufficient to change driving behavior by disrupting habits and permitting concomitant motivation change because they restructure the decisional context.

Hypothesis 1. Economic incentives for fuel-efficient driving induce eco-driving and, thus, lead to a reduction of fuel consumption.

However, there are many different types of economic incentives that have potentially different (non-)effects on the driving style of fleet drivers. A further differentiation is necessary.

2.3. Monetary and non-monetary incentives for eco-driving

While the impact of an incentive certainly also depends on its specific characteristics, i.e., structure, magnitude and timing [28], behavioral psychology generally ascribes stronger effects to rewards than punishments [29]. We follow this notion and analyze the two major types of positive incentives or rewards: monetary (cash) and non-monetary rewards (non-cash).

Several meta-studies review the empirical evidence on the use of incentives in firms and in other settings, and demonstrate that monetary incentives lead to a performance increase in many different settings [30] [31] [32] [33]. Following rational economic theory, employees should always favor monetary incentives (cash) over non-monetary incentives because of the option value of money [34]. Furthermore, providing non-monetary incentives is more difficult for employers than offering a monetary incentive because it is difficult to match non-monetary incentives with the preferences of all employees [35]. In line with this view, Condly et al. (2003) [30] find in their meta-study that the performance gains for money (27%) were about twice the average gains produced by tangible non-monetary incentives (13%).

But they also note that their findings have to be viewed with caution because only few studies on non-monetary incentives were available and they could not determine the actual cash value of the non-monetary incentives that were studied. Still today, only few studies provide an academically sound and direct comparison of monetary and non-monetary incentives with equal monetary value [34]. However, several studies have demonstrated that non-monetary incentives can in fact have a stronger positive effect on performance than equivalent monetary incentives [34] [35] [36] [37] [38] [39]. Even when employees expressed a preference for cash incentives when asked directly, non-monetary incentives have proven to be more effective at improving the same employees' performance [34] [37].

Since the monetary value of the provided incentives in this study is not exceptionally high, we hypothesize that the above described soft advantages of the tangible non-monetary incentive will result in a higher fuel efficiency than the equivalent monetary incentive.

Hypothesis 2. Tangible non-monetary incentives for fuel-efficient driving induce stronger eco-driving and, thus, lead to a higher reduction of fuel consumption than monetary incentives with equivalent cash value.

3. Experimental design and procedure

We conducted a natural field experiment with employees (n = 86) of a German logistics company who distribute small consumable products and service the points of sale of the company's customers with light commercial vehicles.

We employed a between-subjects experimental design with a control group without any incentive and two incentive treatment groups (a monetary incentive and a tangible non-monetary incentive). Since discussions between drivers of the different groups had to be avoided in order to prevent irritations and confounding effects, drivers could not be assigned randomly to one of the groups. Instead, since the company has three different branches in three different states with similar fleets and processes, the same treatment was introduced to all drivers of a certain branch (control group: n=24; monetary incentive group: n=22; non-monetary incentive group: n=40). The branch with likely the highest fuel saving potential was chosen as control group.

Drivers of the two incentive treatments were rewarded for eco-driving, i.e., for an average fuel consumption below an individual reference value (in liters per 100 kilometers). This reference value was calculated individually by the company for every driver as the mean of an individual past fuel consumption value and the average past fuel consumption value of all drivers with the same vehicle type in the same branch (so, e.g., drivers who had already kept a fuel-efficient driving habit before the experiment would have a reference value which is higher than their past individual average consumption). If a driver realized a fuel consumption value below the reference value during the six months of the experiment, the mathematical savings in fuel costs were calculated and distributed evenly between the driver and the company. The drivers in the monetary incentive treatment received the incentive value in cash. The drivers in the tangible non-monetary incentive treatment received a voucher, worth the calculated incentive value, for cinema, wellness, social events, and restaurant visits depending on the driver's individual preferences (combinations were possible).

Three months before the introduction of the incentives the company started to log the individual fuel consumption data on a monthly basis. By the end of June 2013, the monetary and the tangible non-monetary incentives were introduced to the drivers of the respective treatment branches. Over the following six months until the end of 2013, the company collected individual fuel consumption data on a monthly basis.

4. Results

A comparison of the branches' average fuel consumptions before the treatment and during the 6 months long treatment period shows high differences between the branches (see table 1). The non-monetary treatment group exhibits a strongly significant and much higher reduction (11.9%) of the average fuel consumption than the other two groups in the treatment period.

Table 1. Summary of all experimental groups' average fuel consumptions before and during the experiment

	Fuel consumption (l/100km)		
Experimental group / branch	**HY1 2013**	**HY2 2013**	**Delta (%)[a]**
Non-monetary treatment	9.85	8.68	-11.9%***
Monetary treatment	8.83	8.53	-3.4%**
Control	10.24	9.85	-3.8%
ALL GROUPS	9.63	8.93	-7.3%***

[a] Wilcoxon signed-rank test for mean differences: *** p<0.01, ** p<0.05, * p<0.1.

Since differences in fuel consumption between the branches have already existed before the experiment, this reduction cannot be attributed solely to the treatment effect without considering other potentially influential factors. To analyze whether the monetary or the non-monetary intervention affected the drivers' fuel consumption after controlling for other potential influences, we estimate the following panel data model with random effects and robust standard errors:

$$\text{Consumption}_{it} = \beta_1 * \text{Monetary}_{it} + \beta_2 * \text{Non\_monetary}_{it} + X_{it} * \gamma + v_{it} \text{ with } v_{it} = \alpha_i + \epsilon_{it},\ t = (1,2,\ldots,9) \quad (1)$$

where Consumption_{it} is the driver's average fuel consumption in month t in liters per 100 kilometers. Monetary_{it} and Non_monetary_{it} are indicators for whether the driver is part of one of the treatment groups with the monetary or the tangible non-monetary incentive. X_{it} denote observable control variables (e.g., vehicle type, demographic variables, and weather variables). α_i is the unobserved heterogeneity (varying across drivers but constant over time) and ϵ_{it} is the idiosyncratic error that varies across drivers and time.

Table 2. Estimation results

	consumption	consumption	consumption	consumption	consumption	consumption	consumption
Monetary	-0.473***	-0.569***	-0.648***	-0.346***	-0.322	-0.327	-0.340
	(0.108)	(0.136)	(0.128)	(0.130)	(0.201)	(0.201)	(0.216)
Non-monetary	-0.550***	-0.673***	-0.757***	-0.738***	-0.704***	-0.719***	-0.488**
	(0.118)	(0.149)	(0.158)	(0.177)	(0.233)	(0.228)	(0.224)
Introduction		0.169	0.245*	0.232	0.216	0.240*	0.256*
presence		(0.146)	(0.148)	(0.146)	(0.146)	(0.142)	(0.144)
Vehicle: VW			-0.152	-0.056	-0.0429	-0.00378	-0.00284-
Transporter			(0.186)	(0.170)	(0.172)	(0.179)	(0.180)
Vehicle: Peugeot			1.187***	1.805***	1.818***	1.843***	1.842***
Boxer			(0.276)	(0.267)	(0.269)	(0.252)	(0.252)
Location: branch				-0.341	-0.361	-0.382	-0.648*
2				(0.245)	(0.271)	(0.263)	(0.332)
Location: branch				-0.792***	-0.804***	-0.789***	-0.842***
3				(0.198)	(0.230)	(0.233)	(0.285)
June					0.523***	0.521***	-0.292
					(0.182)	(0.183)	(1.161)
August					0.645**	0.638**	-0.629
					(0.254)	(0.253)	(1.541)
October					0.509**	0.503**	0.232
					(0.253)	(0.252)	(0.429)
Age						-0.0148**	-0.0147**
						(0.0072)	(0.0072)
Vocational						0.331	0.334
training						(0.362)	(0.361)
Weather							-0.0032***
							(0.00109)
Constant	9.368***	9.372***	9.146***	9.423***	9.161***	9.507***	8.574***
	(0.131)	(0.131)	(0.167)	(0.174)	(0.238)	(0.425)	(1.303)
R^2	0.0579	0.0610	0.262	0.280	0.309	0.321	0.324

***, **, * indicate the significance at the 1%, 5%, and 10% level. The numbers in parentheses represent robust standard errors.

The estimation results of the average treatment effects and the effects of other independent variables are reported in the table 2. Since we find no significant reduction effect of the monetary incentive, H1 is only partly supported. However, we find a significant effect of the tangible non-monetary incentive on the drivers' fuel consumption ($p<0.030$) with a coefficient of -0.488 liters per 100 kilometer (full model 7). Compared to the overall fuel consumption in the half year before the introduction of the incentives, this denotes a significant average reduction of the fuel consumption by 5% due to the tangible non-monetary incentive. This effect remains strongly significant independent of the inclusion or exclusion of explanatory variables.

At the same time, the drivers' average total distance travelled over the six months treatment period in the treatment branches was even lower compared to the same period one year earlier. In addition, there was no significant increase in the drivers' average travel distance after the experiment. Hence, we find no evidence for a potentially counterproductive influence of the rebound effect in this setting.

These results indicate that the tangible non-monetary incentive for fuel-efficient driving induced stronger eco-driving and, thus, lead to a higher reduction of fuel consumption than the monetary incentive with equivalent cash value. Thus, H2 is supported.

Estimations with OLS and pooled OLS provide very similar results. A fixed effects estimation provides largely comparable results as well, but generally with a bit lower p values and coefficients for the treatment effects. A difference-in-differences estimation with average fuel consumption values from the first and second half of 2013 confirms our overall results as well. These results indicate that our findings are largely robust to changes in the applied regression model.

5. Discussion and conclusion

The purpose of this research was to analyze the effects of economic incentives for eco-driving on fuel consumption in an organizational setting. Our study is the first to systematically analyze and compare a monetary and a non-monetary incentive for eco-driving with a natural field experiment. Generally, we observe a reduction of the average fuel consumption following the introduction of economic incentives. Specifically, we find a significant reduction of fuel consumption of, on average, 5% due to a tangible non-monetary incentive and an average reduction of 3.5% in the equivalent monetary incentive treatment that is only close to significance.

Building on previous studies on the role of habits in transport behavior, we conclude that especially non-monetary elements of an incentive can lead to a significant interruption of the habitual car use and facilitate a deliberate choice of driving behavior to increase eco-driving and, thus, lower fuel consumption and greenhouse gas emissions. Our research indicates that more emphasis on the fun of achieving a higher fuel efficiency, a more emotional response to non-monetary incentives, and a higher frequency of thinking about non-monetary incentives might play a role in the stronger effect of the tangible non-monetary incentive in comparison to an equivalent monetary incentive.

While the results of our field experiment certainly cannot be generalized without limitations, our study makes several important contributions. The results show that certain types of incentives for eco-driving should be considered by policy makers and the transport industry as a viable option to reduce fuel consumption in the future. Furthermore, we contribute to the important stream of literature analyzing the efficacy of monetary and non-monetary incentives for energy conservation [10] [40]. In addition, our study is arguably the first within transportation research to apply a natural field experiment to demonstrate causality in the evaluation of interventions to change driving behavior [16]. Thus, it serves as template for future studies evaluating the efficacy of energy efficiency measures in the transport sector with controlled experiments [41].

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References

[1] IPCC. *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, New York: Cambridge University Press; 2007.

[2] ITF. *Reducing Transport Greenhouse Gas Emissions. Trends and Data. International Transport Forum on Transport and Innovation: Unleashing the Potential*; 2010. http://www.internationaltransportforum.org/Pub/pdf/10GHGTrends.pdf (23 September, 2014).

[3] McKinnon A. *The Potential of Economic Incentives to Reduce CO2 Emissions from Goods Transport. International Transport Forum on Transport and Energy: the Challenge of Climate Change*; 2008. http://www.internationaltransportforum.org/Topics/Workshops/WS3McKinnon.pdf (23 September, 2014).

[4] OECD. *World Energy Outlook 2012*. OECD Publishing; 2012.

[5] Anable J, Bristow AL. *Transport and Climate Change: Supporting document to the CfIT report. Report prepared for the Climate Change Working Group of the Commission for Integrated Transport*. London, United Kingdom; 2007.

[6] Dorrer C. *Effizienzbestimmung von Fahrweisen und Fahrerassistenz zur Reduzierung des Kraftstoffverbrauchs unter Nutzung telematischer Informationen*. Renningen: Expert-Verlag; 2004.

[7] Santos G, Behrendt H, Teytelboym A. Part II: Policy instruments for sustainable road transport. *Research in Transportation Economics* 2012;**28:**46–55.

[8] van der Voort M, Dougherty MS, van Maarseveen M. A prototype fuel-efficiency support tool. *Transportation Research Part C: Emerging Technologies* 2001; **9**: 279–17.

[9] Stern PC. New Environmental Theories: Toward a Coherent Theory of Environmentally Significant Behavior. *Journal of Social Issues* 2000;**56**: 407–17.

[10] Abrahamse W, Steg L, Vlek C, Rothengatter T. A review of intervention studies aimed at household energy conservation. *Journal of Environmental Psychology* 2005;**25**: 273–18.

[11] Asmus S, Karl F, Grassl M, Mohnen A, Reinhart G. Energy efficiency in production processes - the influence of consumption visualization and staff training. In: Seliger G, editor. *Proceedings of 11th Global Conference on Sustainable Manufacturing,* Berlin: Universitätsverlag TU Berlin; 2013, p. 181–186.

[12] Carrico AR, Riemer M. Motivating energy conservation in the workplace: An evaluation of the use of group-level feedback and peer education. *Journal of Environmental Psychology* 2011;**31**: 1–13.

[13] Siero FW, Bakker AB, Dekker GB, van den Burg MTC. Changing organizational energy consumption behaviour through comparative feedback. *Journal of Environmental Psychology* 1996;**16**: 235–11.

[14] Bonsall P, Conner M, Darnton A. *Thinkpiece 1: Influencing Individual Citizens*. University of Leeds: Institute for Transport Studies; 2009.

[15] Weinberger R, Lucas K. Motivating Changes in Auto Mobility. In: Lucas K, Blumenberg E, Weinberger R, editors. *Auto motives. Understanding car use behaviours*, United Kingdom: Emerald, Bingley; 2011, p. 63–23.

[16] Metcalfe R, Dolan P. Behavioural economics and its implications for transport. *Journal of Transport Geography* 2012;**24**: 503–8.

[17] Barkenbus JN. Eco-driving: An overlooked climate change initiative. *Energy Policy* 2010;**38**: 762–7.

[18] Cloke J, Harris G, Latham S, Quimby A, Smith L, Baughan C. Reducing the environmental impact of driving: a review of training and in-vehicle technologies. *TRL report* 1999;**384**: 1–32.

[19] Daun TJ, Braun DG, Frank C, Haug S, Lienkamp M. Evaluation of driving behavior and the efficacy of a predictive eco-driving assistance system for heavy commercial vehicles in a driving simulator experiment. In: IEEE, editor. *16th International IEEE Conference on Intelligent Transportation Systems (ITSC)*, Piscataway: IEEE; 2013, p. 2379–2386.

[20] Gardner B. Modelling motivation and habit in stable travel mode contexts. *Transportation Research Part F: Traffic Psychology and Behaviour* 2009;**12**: 68–8.

[21] Webb TL, Sheeran P. Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. *Psychological bulletin* 2006;**132**: 249–19.

[22] Danner UN, Aarts H, de Vries NK. Habit vs. intention in the prediction of future behaviour: the role of frequency, context stability and mental accessibility of past behaviour. *The British journal of social psychology / the British Psychological Society* 2008;**47**: 245–21.

[23] Brette O, Buhler T, Lazaric N, Marechal K. Reconsidering the nature and effects of habits in urban transportation behavior. *Journal of Institutional Economics* 2014;**10**: 399–27.

[24] Eriksson L, Garvill J, Nordlund AM. Interrupting habitual car use: The importance of car habit strength and moral motivation for personal car use reduction. *Transportation Research Part F: Traffic Psychology and Behaviour* 2008;**11**, 10–13.

[25] Thøgersen J. The Importance of Timing for Breaking Commuters' Car Driving Habits. *COLLeGIUM: Studies across Disciplines in the Humanities and Social Sciences* 2012;**12**: 130–10.

[26] Fujii S, Kitamura R. What does a one-month free bus ticket do to habitual drivers? An experimental analysis of habit and attitude change. *Transportation* 2003;**30**: 81–14.

[27] Thøgersen J, Møller B. Breaking car use habits: The effectiveness of a free one-month travelcard. *Transportation* 2008;**35**: 329–16.

[28] Dolan P, Hallsworth M, Halpern D, King D, Metcalfe R, Vlaev I. Influencing behaviour: The mindspace way. *Journal of Economic Psychology* 2012;**33:** 264–13.

[29] Khademi E, Timmermans H. The Long-term Effectiveness of a Reward Scheme in Changing Daily Travel Choices. *Procedia - Social and Behavioral Sciences* 2014;**111**: 380–9.

[30] Condly SJ, Clark RE, Stolovitch HD. The Effects of Incentives on Workplace Performance: A Meta-analytic Review of Research Studies 1. *Performance Improvement Quarterly* 2003;**16**: 46–17.

[31] Garbers Y, Konradt U. The effect of financial incentives on performance: A quantitative review of individual and team-based financial incentives. *Journal of Occupational and Organizational Psychology* 2014;**87**: 102–35.

[32] Jenkins Jr GD, Mitra A, Gupta N, Shaw JD. Are financial incentives related to performance? A meta-analytic review of empirical research. *Journal of Applied Psychology* 1998;**83**: 777–10.

[33] Prendergast C. The provision of incentives in firms. *Journal of Economic Literature* 1999;**37**: 7–56.

[34] Jeffrey SA. Justifiability and the Motivational Power of Tangible Noncash Incentives. *Human Performance* 2009;**22**: 143–12.

[35] Shaffer VA, Arkes HR. Preference reversals in evaluations of cash versus non-cash incentives. *Journal of Economic Psychology* 2009;**30**: 859–13.

[36] Alonzo V. The trouble with money. *Incentive* 1996;**170**: 26–4.

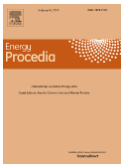
[37] Dzuranin AC, Randolph D, Stuart NV. Doing More With Less: Using Noncash Incentives to Improve Employee Performance. *Journal of Corporate Accounting & Finance* 2013;**24**: 75–5.

[38] Dzuranin AC, Stuart NV. The Effect of Tangible and Intangible Noncash Rewards on Performance and Satisfaction in a Production Setting. *Management Accounting Quarterly* 2012;**13**: 1–9.

[39] Jeffrey SA, Adomdza GK. Incentive Salience and Improved Performance. *Human Performance* 2010;**24**: 47–12.

[40] Mizobuchi K, Takeuchi K. The influences of financial and non-financial factors on energy-saving behaviour: A field experiment in Japan. *Energy Policy* 2013;**63**: 775–12.

[41] Suter JF, Shammin MR. Returns to residential energy efficiency and conservation measures: A field experiment. *Energy Policy* 2013;**59**: 551–10.



Biography

Dominik L. Schall is a doctoral candidate at TUM School of Management, Technische Universität München (TUM). His main research focus is on the causes of and barriers to sustainable behavior, especially drivers of energy-efficient behavior, the reduction of overconfidence, and the motivation behind private investments in renewable energy.